

IAASS - Abstract

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Paper Title: Improving Safety on the International Space Station: Transitioning to Electronic Emergency Procedure Books on the International Space Station

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Abstract:

The National Aeronautics and Space Administration (NASA) originally designed the International Space Station (ISS) to operate until 2015, but have extended operations until at least 2020. As part of this very dynamic Program, there is an effort underway to simplify the certification of Commercial-of-the-Shelf (COTS) hardware. This change in paradigm allows the ISS Program to take advantage of technologically savvy and commercially available hardware, such as the iPad. The iPad, a line of tablet computers designed and marketed by Apple Inc., was chosen to support this endeavor. The iPad is functional, portable, and could be easily accessed in an emergency situation.

The iPad Electronic Flight Bag (EFB), currently approved for use in flight by the Federal Aviation Administration (FAA), is a fraction of the cost of a traditional Class 2 EFB. In addition, the iPad's ability to use electronic aeronautical data in lieu of paper in route charts and approach plates can cut the annual cost of paper data in half for commercial airlines. ISS may be able to benefit from this type of trade since one of the most important factors considered is information management.

Emergency procedures onboard the ISS are currently available to the crew in paper form. Updates to the emergency books can either be launched on an upcoming visiting vehicle such as a Russian Soyuz flight or printed using the onboard ISS printer. In both cases, it is costly to update hardcopy procedures. A new operations concept was proposed to allow for the use of a tablet system that would provide a flexible platform to support space station crew operations. The purpose of the system would be to provide the crew the ability to view and maintain operational data, such as emergency procedures while also allowing Mission Control Houston to update the procedures.

The ISS Program is currently evaluating the safety risks associated with the use of iPads versus paper. Paper products can contribute to the flammability risk and require manual updates that take time away from research tasks. The ISS program has recently purchased three iPads for the astronauts and the certification has been approved. The crew is currently using the iPads onboard. The results of this analysis could be used to discern whether the iPad is a viable option for use in emergencies by assessing the risk posture through the development of a quantitative probabilistic risk assessment (PRA).

In order to fully understand the performance of the iPad in-flight and at various altitudes, a survey was done. Testing, certification, and failure mode data for the iPad was gathered from external sources such

as the: FAA, Commercial Airlines, and United States Air Force. The data obtained from the questionnaire would be useful in creating a quantitative fault tree to assess the risk of using the iPad on-board of the ISS and as an electronic version of emergency procedures.

The results of the PRA indicate that the iPad should be used on the ISS as an alternative method of retrieving emergency procedures, with appropriate mitigation plans in place.